

# IADB SIM Research Engagement Opportunity

2017 Guidance and Application

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## **Activity and Application Guidance**

In support of the Sistema Interamericano de Metrología (SIM) Project with the Inter-America Development Bank (IADB) on “Strengthening National Metrology Institutes in the Hemisphere, in support of emerging technologies”, SIM member National Metrology Institutes (NMIs) and Designated Institutes (DIs) are invited to submit joint research proposals to advance development of technical research capabilities in metrology related to emerging technologies such as advanced manufacturing, nanotechnology and biotechnology.

The SIM Technical Committee Chair will accept joint research proposals from any SIM Member NMI or DI that includes at least two SIM partner institutions. All proposals will require management approval, and details on the objectives and benefits of each activity. The application may be found on Page 2 of this document.

Project requests may not exceed u\$s 45.000. The requested funds can be used to support exchange of scientists, organize meetings, workshops, intercomparisons and pilot studies.

Proposals shall be send to SIM Technical Committee Chair ([csanto@latu.org.uy](mailto:csanto@latu.org.uy)) with copy to SIM Secretariat ([Simkin@inti.gob.ar](mailto:Simkin@inti.gob.ar)).

## **Application and Administrative Review Timeline**

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The table below includes both deadlines for applicants and other important dates that should be kept in mind when preparing associated activity arrangements.

<b>Application Processing</b>	<b>Important dates &amp; Deadlines (see explanation below)<sup>1</sup></b>
Application Announcement	26 <sup>th</sup> December 2016
Application Deadline ( <i>all applications</i> )	17 <sup>th</sup> March 2017
Applicant(s) Notified of Final Decision	10 <sup>th</sup> April 2017

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Selection Criteria:

Applications will be evaluated based on need and potential impact.

Contribution to IADB project goals (see project goals at the end of this document)

Contribution to addressing measurement challenges associated with emerging technology

New collaboration or continuation or expansion of existing collaboration.

Benefit to partners and to region

Number of countries (minimum 2)

## Application

Please do not exceed two pages.

<b>Partner Institutions</b> (include PI, email and address for each NMI)	<ol style="list-style-type: none"><li>1) Centro Nacional de Metrología (<b>CENAM – México</b>) Km 4.5 Carretera a los Cués, El Marques, Querétaro, MEXICO C.P. 76060 Miguel Viliesid Alonso (<a href="mailto:mviliesi@cenam.mx">mviliesi@cenam.mx</a>); Carlos A. Galvan-Hernandez, (<a href="mailto:cgalvan@cenam.mx">cgalvan@cenam.mx</a>)</li><li>2) Instituto Nacional de Metrologia, Qualidade e Tecnologia (<b>INMETRO - Brazil</b>) Santa Alexandrina St, 416. Rio Comprido - Rio de Janeiro - RJ – Brazil Ricardo França (<a href="mailto:rsfranca@inmetro.gov.br">rsfranca@inmetro.gov.br</a>); Iván Silva (<a href="mailto:ilsilva@Inmetro.gov.br">ilsilva@Inmetro.gov.br</a>) Iakyra Couceiro (<a href="mailto:ibcouceiro@inmetro.gov.br">ibcouceiro@inmetro.gov.br</a>)</li><li>3) Instituto Nacional de Tecnología Industrial (<b>INTI – Argentina</b>) Av. Gral. Paz 5445 – B1650KNA , San Martín, Buenos Aires, Argentina Liliana Álvarez (<a href="mailto:alvarez@inti.gob.ar">alvarez@inti.gob.ar</a>); Karina Bastida (<a href="mailto:bastida@inti.gob.ar">bastida@inti.gob.ar</a>)</li><li>4) Laboratorio Costarricense de Metrología (<b>LACOMET - Costa Rica</b>) Ciudad de la Investigación de la UCR, San Pedro, San José, Costa Rica. (De la Muñoz y Nanne en San Pedro, 500 m hacia el Norte). Apdo Postal: 1736-11501 San Pedro Montes de Oca, Costa Rica Leonardo Rojas (<a href="mailto:lrojas@lacomet.go.cr">lrojas@lacomet.go.cr</a>); Olman Ramos (<a href="mailto:oramos@lacomet.go.cr">oramos@lacomet.go.cr</a>)</li><li>5) Laboratorio Tecnológico del Uruguay (<b>LATU -Uruguay</b>).Avda. Italia 6201 – Montevideo, Uruguay. Alejandro Acquarone (<a href="mailto:aacqua@latu.org.uy">aacqua@latu.org.uy</a> )</li></ol>
<b>Project Description</b> <i>Briefly describe the research project, highlighting key objectives and expected contributions of each of the partners</i>	<p><b>Improvement and updating of interferometric systems for traceable dimensional nanometrology at SIM</b></p> <p>This project focuses on cross validation of flatness calibration/measurement systems at two of SIM-NMIs (INMETRO and INTI), who already have a Fizeau interferometer for flatness-deviation calibration of optical flats, extending its traceability/metrological control to the SIM-NMIs and with a view to developing measuring capabilities in the field of nanometrology. In this project INMETRO and INTI will automate optical flatness measurements with the help of, CENAM (México), LACOMET (Costa Rica), and LATU (Uruguay) who also will receive the transfer of the technology and knowledge. Some common goals for the project members are:</p> <ul style="list-style-type: none"><li>- Complement information and expertise exchange of the five NMIs in development and validation of new automated methodology in flatness deviation measurements;</li><li>- Analysis of uncertainty contributions for those automated systems;</li><li>- To provide traceability to the other SIM-NMIs in the nanoscale;</li><li>- To launch a stable basis for new comparisons at SIM in flatness deviation;</li></ul> <p>It would be expected the designs and improvements reached by this project will be transfer to all the SIM – NMIs, for instance, CENAM, LACOMET and LATU, in order to replicate this type of system at their facilities.</p>

<b>Potential impact/project goals:</b> <i>briefly describe the measurement challenge this research project is expected to address</i>	<p>This project will allow to expand the measurement range and to reduce uncertainties for services currently offered for clients, opening new trends in optical system developments for length unit measurements in nanometrology.</p> <p>The potential impacts of this project will be:</p> <ul style="list-style-type: none"> <li>- Possibility of perform measurement of flatness deviations for alternative non-transparency and not-round artifacts, aiming industry and metrology labs;</li> <li>- Starting of establishing regular round-robin, bi- and multilateral comparisons in flatness measurements for the SIM members;</li> <li>- Achieve better metrological accuracy by improving the current interferometric systems</li> </ul> <p>These potential impacts are expected to have a direct effect on the industry in the partner countries and the region, providing a good starting point for the beginning of new developments in the fields of nanometrology.</p>
<b>Project relevance:</b> <i>briefly describe the relevance of the project to IADB/SIM Project Goals</i>	<p>This proposal is based on spreading new innovative methods for automate optical flatness measurements, as developed at INMETRO and INTI, extending the range to the nanoscale. New developed methodologies are based on finite element methods on the partition in digitized images of interferograms, obtained for flatness deviation measurement of optical surfaces, and use of some advanced computation methods as Monte Carlo's. This also includes the improvement of the experimental techniques for instance the implementation of phase stepping interferometry and the development of the corresponding algorithms.</p> <p>The new mathematical and computational modeling techniques should be analyzed and validated by metrological ways through interchange between NMI experts in measurement of optical parameters, and further extend them to other stakeholders as well as to accredited calibration laboratories and to the industrial sector in the SIM region.</p>
<b>New or Existing Collaboration</b> <i>briefly explain is this is a new collaboration? or an extension or expansion of existing collaboration?</i>	<p>INMETRO, INTI and LACOMET started some interaction few years ago: in 2014, INTI staff made a research visit to INMETRO and in 2016 LACOMET staff took a length measurement training course at INTI. CENAM and INTI had non-formal interaction some years ago and between LATU and INTI the interaction in the optical fields started recently. This proposal gives us a framework to formalize the collaboration between, CENAM, INMETRO, INTI, LACOMET and LATU in the field of optics.</p>
<b>Tentative Dates</b> <i>Expected start and end dates</i>	<p>01/07/2017 -30/06/ 2019</p>
<b>Project cost</b> <i>Please provide an estimated cost (NTE 40K)</i>	<p>\$ 30,000.00</p>

**Benefit to SIM:**

- Establish the basis for developing of the traceability in the nanometrology field, such as microscopy applications.
- Provide the SIM with a new comparison in the field of length measurement, such as the flatness deviation.
- All the metrological knowledge generated by this project will be transfer to all of the SIM members who request it. It will give to the NMIs of the region the possibility of developing new CMCs.
- Strengthen interactions between the SIM institutes.

**Benefit to Participating Metrology Institute(s):**

- To implement new automated measurement systems in flatness measurements and to evaluate the uncertainty components of this parameter.
- Extend the traceability in flatness measurements to the SIM-NMIs. This will give the chance of generate new CMCs in nanoscale.
- INMETRO and INTI will transfer to CENAM, LACOMET and LATU the know-how for length measurement by optical method. This will give to CENAM, LACOMET and LATU the input to start a new line in the optical metrology.

**Anticipated results/impact:**

- To participate and pilot comparisons on flatness measurements. This kind of comparison has never been offered by SIM.
- To improve the current Fizeau interferometers at INMETRO and INTI and evaluate its capabilities to extend the calibration ranges and their fields of application.
- To expand the knowledge of the current Fizeau interferometers and the improvement of them, to other SIM-NMI, as CENAM from México, LACOMET from Costa Rica and LATU from Uruguay.
- The basis for developing of the traceability in the nanometrology field.

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**Objectives of SIM-IADB Project.** *The General Objective is: Development and implementation of new measurement expertise available in member countries to address emerging technology needs. The three specific objectives: (i) Promote a climate of innovation, competitiveness and productivity by enhancing the delivery of advanced measurement services needed by firms for the development and adoption of emerging technologies; (ii) Facilitate public-private sector dialogue between the national measurement institutes and stakeholders in government and industry to improve the regulatory framework in the hemisphere needed to develop innovative companies bringing new products and technologies to the marketplace; and (iii) Promote the mutual acceptance of measurement results necessary not only for trade, but also to facilitate cooperative R&D projects between different member countries, and between LAC and other regions.*

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