

RESEARCH AND STANDARDISATION

RESPONSE FORM for Standardisation groups



To contribute to *EMPIR - the European Metrology Programme for Innovation and Research* *

Objective: to collect standardization needs and suggestions to develop research projects in testing and measurements for the upcoming EM-PIR calls (2019 and 2020)

In the frame of the between CEN, CENELEC and EURAMET, CEN and CENELEC have been invited by the EURAMET Management to put forward their **testing and measurement needs in research** for consideration by metrology institutes for future calls under EMPIR.

Relevant technical groups (sector fora, advisory boards, coordination groups, TCs, WGs...) **are invited to contribute with**

- a short introduction or an overview paper of their unaddressed standardization needs for testing and measurement, and
- a contact person (secretary, chair, convenor, liaison officer, etc.) whom proposers for the Potential Research Topics can contact,

by using this Response Form and send it at :

STAIR EMPIR secretariat, Mr Ortwin Costenoble: empir@nen.nl

Deadline for the consultation: **14 December 2018**.

Proof of need by the TC/SC is highly recommended for a successful submission.

<p>Source of the identified need (identification of TC, WG, etc, incl. title)</p>	<p><input type="checkbox"/> CEN/TC 0/WG 0 <input checked="" type="checkbox"/> CLC/FR 113/WG 0 <input type="checkbox"/> ISO/TC 0/SC 0 / WG 0 <input checked="" type="checkbox"/> IEC/TC 113/SC 0 / WG 8 <input checked="" type="checkbox"/> Other, namely GFSC (<i>Graphene Flagship Standardization Committee</i>)</p>
<p>European entity responsible for submission of the need</p>	<p>CLC/SR 113 <i>“Nanotechnology standardization for electrical and electronics products and systems”</i> in co-operation with IEC/TC 113 <i>“Nanotechnology for electrotechnical products and systems”</i></p>
<p>Person that can be contacted for more detail</p>	<p>Name: Akira Ono Role: Chairman IEC/TC 113 E-Mail: ono.akira@aist.go.jp Mobile: +81 (90) 3906-5007 Country: Japan</p>

	<p>Name: <i>Norbert Fabricius</i></p> <p>Role: <i>Secretary IEC/TC 113</i> <i>Chairman Graphene Flagship Standardization Committee</i></p> <p>E-Mail: <i>norbert.fabricius@kit.edu</i></p> <p>Telephone: <i>+49 (721) 608-28585</i></p> <p>Mobile: <i>+49 (151) 17450442</i></p> <p>Country: <i>Germany</i></p>
<p>Unaddressed need (short description)</p>	<p>Title and short scope/description of the need as such:</p> <p><i>Measurement methods for key control characteristics of graphene, especially stability and reliability testing of graphene materials.</i></p> <p>Since graphene-based nanotechnology was identified as one of the big opportunities for Europe for the future the EU commission has established a FET project (Graphene Flagship) to support the industrialization of graphene technologies. Shortly after the start of the Flagship a cooperation between the Flagship and IEC/TC 113 was established which was recently transformed into a formal C liaison between both partners. In IEC/TC 113, there are currently more than 25 standards under development to support the industrial use of the material. Due to the early stage of the technology it is necessary to adopt existing measurement methods. At the same time, new methods must be developed to fill identified gaps.</p> <p>For graphene to be incorporated into electrotechnical products it is evident that the reliability of the graphene subassemblies is a key issue. For this reason, IEC/TC 113 has incorporated reliability testing for graphene into its work program. Electrical KCC (conductivity, mobility, etc.) are not only particularly relevant for the most demanding applications of graphene, but are also correlated with other physical and chemical KCC and their possible degradation, and are therefore suitable - where measurement are performed under metrological control - for non-destructive, long-term in-situ monitoring, possibly also under harsh environmental conditions.</p> <p>Dealing with the extreme thin layers of graphene is very challenging so that commonly used techniques must be evaluated very carefully before they can be applied. For this reason, IEC/TC 113 is seeking opportunities to involve the National Metrology Institutes (NMI) into the standardization activities. There are already good examples which shows that projects with significant contributions of NMIs tends to be successful:</p> <p>IEC/TS 62607-6-4, the worldwide first graphene measurement standards was led by an NMI (NIST). Furthermore, there are two Euramet EMPIR projects on graphene electrical properties (GRACE) and nanoscale magnetic field measurements (NanoMag) supporting the work of TC 113 very successfully.</p>

<p>Further explanation of need (TC business plan, road map, formal decision, work item, etc.)</p>	<p><i>Further explanation on the need, why it shall be filled and why specifically related to standard</i></p> <p><i>Estimated time frame that need shall be fulfilled:</i></p> <p>There are already two projects in ITC/TC 113 addressing environmental tests and sample preparation:</p> <ul style="list-style-type: none"> • IEC TS 62607-6-15 “Nanomanufacturing – Key control characteristics – Part 6-15: Sample preparation for the reliability test of sheet resistance and contact resistance for graphene and two-dimensional materials” • IEC TS 62876-3-1 “Nanomanufacturing - Reliability assessment - Part 3.1: Graphene - Stability test: Temperature and humidity” (forecast publication date 2019-10) <p>Further parts shall focus on mechanical and application-related tests. These need further metrological research.</p> <p>IEC/TC 113 has a development plan which consists of more than 200 combinations of key control characteristics, measurement methods and graphene material types (see enclosure).</p> <p>The projects above are very challenging as the dealing with topics at the frontier of the new technology. It is expected that the NMIs can contribute not only by the development of accurate, reproducible and traceable measurement of physical and chemical properties but also to define their applicability to generate quantitative reliability data for lifetime applications.</p>
<p>Enclosures</p>	<p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p>

*See more information at [EMPIR website](#)
[CEN/CENELEC website](#) “Standards and metrology”