Metrology – the science of correct measurement – is an essential cornerstone of our industrialized society. It has an impact on essentially every aspect of our lives, and metrological progress is a key enabler for technical development. Germany's oldest and renowned technical university, TU Braunschweig, and one of the top measurement institutions in the world, Physikalisch-Technische Bundesanstalt, joined forces to establish an international metrological training center – Braunschweig International Graduate School of Metrology (B-IGSM) – to foster metrological knowledge in all areas of science and engineering. Our research fields are in particular Metrology for Society, Industrial Metrology and Fundamentals of Metrology.

B-IGSM offers a structured doctorate in cutting edge research combined with a metrological qualification program where a metrological certificate can be earned. The graduate school supports its PhD students in acquiring key competences in metrology by offering a curriculum on metrological concepts and research as well as on structures of metrology and regulatory activities. The curriculum is supplemented by workshops, topical courses, international summer schools and other activities. IGSM PhD researchers are coached and advised by scientists both of TU Braunschweig and PTB.

To support developing and emerging countries in the field of quality infrastructure the German Federal Ministry for Economic Cooperation and Development (BMZ) provides funding for two

PhD scholarships
for a natural scientist or engineer.

Initially, funding will be granted for one year. Given that it typically takes three years to complete a doctoral thesis PTB will be committed to obtain a follow-up funding. The size of the grants is comparable to grants provided by the German Academic Exchange Service (DAAD). Both scholarships will be located at TU Braunschweig.

To be basically eligible for application you need to be a member of a national metrology institute or a designated institute of a developing or emerging country. An excellent academic record and fluent English are prerequisites; skills in the German language are welcome. The submission should include CV, transcripts of the most important documents of professional qualification and a letter of application. B-IGSM promotes the professional equality of women and men and is thus especially interested in applications from women. Disabled persons will be given priority if they have the same occupational aptitude.

Any granting of a scholarship has to be approved by the International Office of TU Braunschweig taking into account the Promotionsordnung (PhD Regulations) of the respective faculty where the scholarship will be located.

Please note that any application needs to be submitted via the application portal of B-IGSM at www.igsm.tu-bs.de. Deadline for applications is 28 February 2015.

Applications are invited for the following topics:

1. Optical properties and metrological relevance of nanomaterials

Within this thesis nanomaterials and composite nanomaterials based on metal oxides, metals and organic components will be prepared and investigated. The aim is to establish a basis of their use in sensors and applications in life science within a metrological framework.

Applicants should have a master or comparable degree in physics, chemistry or material science.

Further information:
Prof. Peter Lemmens, Institute of Condensed Matter Physics, TU Braunschweig,
p.lemmens@tu-bs.de

2. Simple high precision normal for the unit "Tesla" based on a H-NMR sample holder with integrated electronics

The primary standard for the unit Tesla is realized by using H-NMR. The measurement procedure for proton resonance will be realized with an integrated electronics in a compact probe for the precise calibration of magnetic coil systems. Such coil systems are very important for the investigation and calibration of all magnetic sensor systems in automotive systems and in any kind of industrial control circuits where magnetic sensors are used for the determination of distances and motions.

Applicants should have a master or comparable degree in physics, chemistry or electrical engineering.

Further information:
Prof. Meinhard Schilling, Institute for Electrical Measurements, TU Braunschweig,
m.schilling@tu-bs.de

3. Dimensional metrology for automation science - high precision length measurement in 3D-Printers

The dimensional metrology in automation science needs in many set-ups simple but accurate length measurements. This thesis will investigate sensors like electronic calipers in combination with a simple interferometric set-up. The length measurement will be integrated in microcontroller based electronics of one of our 3D-printers and will be used first to calibrate this instrument and then the integration in a control circuitry for long-term stabilization is investigated.

Applicants should have a master or comparable degree in physics or electrical engineering.

Further information:
Prof. Meinhard Schilling, Institute for Electrical Measurements, TU Braunschweig,
m.schilling@tu-bs.de

4. Evaluation of geometrical parameters of workpieces in serial production under harsh environmental conditions by referring to calibrated reference-parts

Temperature changes are well known to have a large influence on measurement processes. In general nominal values of measurands are defined for a standard temperature of 20 °C. In many developing countries typical air temperatures are considerably above this standard temperature. On the other hand it is quite expensive to provide stable air conditioning for production facilities. One approach to overcome this problem in serial production testing is to refer to calibrated reference-parts. These are serial parts that are measured in a

measurement laboratory with standard environment. The geometry of each serial part under test is compared to the geometry of this reference-part under production environment. If the shape deviation exceeds a certain tolerance limit the part under test is refused. In this way a good/fail decision can be made.

While this approach is already in use today, we want to go further: Combining the measurement data of the workpiece and the reference-part taken under production temperature T_p and the measurement data of the reference-part taken under standard temperature T_0 = 20 °C we want to determine the geometrical data of the workpiece under standard temperature T_0 = 20 °C. In addition, the measurement uncertainty of these data shall be estimated.

Applicants should have a master or comparable degree in physics or engineering.

Further information:
Prof. Rainer Tutsch, Institute for Production Metrology, TU Braunschweig,
r.tutsch@tu-bs.de

5. Development of metrological techniques for nanoLEDs for the assessment of their performance

The Institute of Semiconductor Technology is developing novel LED concepts for efficient solid state lighting, in closed collaboration with Osram Germany. A particular research interest is the exploration of 3D nanoLEDs. In order to analyse these nanoLEDs, novel metrology has to be developed, since most of the conventional analysis techniques cannot be used any more. The goal of the thesis is to develop metrological techniques for nanoLEDs in order to assess their respective performance and compare this with conventional planar LEDs. The work will be done in close collaboration of TU Braunschweig and PTB in the new research center for metrology LENA (Laboratory for Nanometrology).

Applicants should have a master or comparable degree in physics or engineering.

Further information:
Prof. Andreas Waag, Institute for Semiconductor Technology, TU Braunschweig,
a.waag@tu-bs.de