Welcome to the GMA Talk, on-line news brief of the global metrology academy (GMA). I am very happy that there have been a lot of precious hands, brains and hearts put together to get this news brief come to existence. The participants of the GMA courses were willing to add their ideas to explore candidate names and to pick up the final winner of the name of GMA Talk. Furthermore, almost all of the articles and reports in this first issue have been filled with what they did at KRISS in diverse forms of HRD in metrology.

GMA Talk has begun with such an enthusiastic will and the spirit of sharing efforts of readers and participants. As such, GMA and the GMA Talk will be making strides hand in hand among all of us towards its common goal of sharing prosperity. I am confident that the future of GMA will therefore be growing much more fruitful as GMA and all of its staff members are firmly standing in a close partnership with and for the benefit of all and individual customers and readers in terms of HRD in metrology. For this, please do not hesitate to advise us of whatever we need to do to make it better.

Again, thanks a lot for your cooperation, and I look forward to keeping in close touch with everyone of you.

Gyeong-Hee Nam, Ph.D.
Head of GMA, Editor-in-Chief
MISSION, FUNCTION, VISION

Mission

To develop programs of metrology HRD

To operate education/training courses in metrology

To promote ODA in metrology for the developing world

Vision

To be the global center of excellence for metrology HRD

Function

To develop programs of metrology HRD

To operate education/training courses in metrology

To promote ODA in metrology for the developing world

Launched in December 2012, GMA has been assigned with a mission of cultivating professional human resources required by customers over wide sectors of metrology community. With its target audience both from local and foreign metrology laboratories, GMA develops and operates education and training programs covering a variety of key subjects in metrology. In pursuit of better performance in delivering quality programs meeting the practical needs of customers, GMA has been making its very best efforts towards a vision to be the global center of excellence for HRD in metrology.
On 500,147 m² site of its campus, KRISS has more than 20 buildings, which are accommodating R&D activities and technical services in the field of metrology, ranging from fundamental sciences to the cutting-edge areas of applied measurement technologies.

**Portfolio of GMA Programs**

- **Courses at KRISS**
  - **Group courses**
    - Duration: Two-week intensive programs
    - Covering fundamental subjects of metrology
    - Lectures combined with hands-on practice
  - **Individual courses**
    - Duration: Two weeks to one year
    - Tailored to meet the specific needs of customers

- **Outreach Services on site of customers**
  - A group of metrologists of KRISS visiting customers on site
  - Offering on-site technical advice, training and lectures
  - Capability evaluation, offering recommendations of action plans
  - Advice on strategic planning of national standards system, etc.

For advanced academic degrees, the **UST-KRISS joint graduate school of metrology** (www.ust.ac.kr) is open to all nationals. Young metrologists are strongly recommended to take chances of studying at KRISS under the unique program. More details are available at www.ust.ac.kr.
For a couple of years of the early stage of its operation, GMA has made significant strides towards achieving its vision to be a global center of excellence in metrology HRD. For the past two years of 2013-2014, GMA offered six (6) group courses with three courses a year. Beneficiaries who enjoyed the group courses comprised 112 participants mostly employed by metrology laboratories from 30 countries of Asia, Africa, Mideast, and South America.

As regards the individual programs, which are tailored to best meet the practical needs of customers, GMA received 16 people from eight countries for the past two years. The individual studies were offered for the accumulated period of 139 person-weeks, including those a few scheduled to take place in the latter half of 2014.

When it comes to the UST-KRISS joint graduate school of metrology, sixteen students have been in progress of their doctoral and master’s courses. Newly joined for the recent two years were nine. Since 2005 when KRISS received its first student under the joint school, fourteen students completed their studies with their doctoral and master’s degrees in measurement sciences. The technical subjects covered by the group and individual courses were focused on the fundamental areas of metrology. It comprises metrology in length and dimensional measurement (LDM), mass and related quantities (MRQ), electricity and magnetism (EM), thermometry and humidity (TH), fluid flow (FF), acoustics and vibration (AV), gas analysis (GA) and metrology in chemistry (MiC).

Services to be offered on site of customers has been under discussion. Upon the request of ZABS, the NMI of Zambia, GMA has been looking for an opportunity to provide its services reaching out on the site of its customer in Africa. A couple of KRISS experts are supposed to be on a mission for one week, offering lectures, fact-finding survey, and technical training on the procure writing based on ISO/IEC guide 17025.

**GROUP COURSES: BENEFICIARIES**

During the first two years ('13-'14) of its operation, GMA offered six (6) times of group courses. It includes the one co-organized by KRISS and UNIDO in 2013. There were 112 participants coming from 30 countries of Asia, Africa, Mideast, and South America.

As statistics shows, its beneficiaries are mostly from the Asian region. GMA looks for more participants from other regions so that its beneficiaries could widely spread over as many metrology communities as possible all over the globe.
GMA has been selecting fundamental subjects of metrology for the theme of each group course. The themes covered by the six group courses offered in 2013-2014 comprise 10 subjects out of the areas of physical metrology, such as length, MRQ, thermometry, humidity, electricity and magnetism. They are all the basic subjects of measurements in which metrology laboratories should have secured its capability so as to meet the needs of their customers.

Not only that, GMA offered a course of metrology in chemistry (MiC). It covered the four principal subjects in MiC, including organic analysis, inorganic analysis, gas analysis, and bioanalysis. The MiC course was organized in response to the ever growing concerns about food safety, climate change, the environment, etc. that are common to all countries either advanced or not. A unique feature of GMA’s group courses is that each course begins with a session of metrology in general prior to intensive technical sessions. It is designed to deliver fundamental knowledge and up-to-date information about metrology to all participants. By putting an emphasis on strategic approaches towards a most effective operation of their national metrology institutes and of national standards systems, it will benefit every participant in playing a leading role in developing their national standards systems up to an advanced level.

### Table: Input, Time, Human Resources

<table>
<thead>
<tr>
<th>Areas covered</th>
<th>Lecturers</th>
<th>Time allocation (min/h)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical metrology</td>
<td>67</td>
<td>12 200/203.3</td>
<td></td>
</tr>
<tr>
<td>Metrology in Chemistry</td>
<td>16</td>
<td>1 830/30.5</td>
<td></td>
</tr>
<tr>
<td>Metrology in General</td>
<td>24</td>
<td>3 280/54.7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>107</td>
<td>17 310/288.5</td>
<td>Net input made on site of six group courses in 2013-2014</td>
</tr>
</tbody>
</table>

In terms of time and human resources invested in the six group courses in 2013-2014, total 107 experts of KRISS shared efforts for up to 17 310 minutes (288.5 h) of time in delivering lectures and practices. To make it in a bit more detail, 67 expert metrologists joined for 12 200 min (203.3 h) covering intensive laboratory sessions of physical metrology. As for the metrology in chemistry, which was operated once in 2013, there were 16 experts of KRISS who shared 1 830 min (30.5 h). When it comes to the metrology in general, 24 experts were invited to speak for 3 280 min (54.7 h). This statistics take into account the net input of the lecturers only made while the courses were taking place on site of KRISS investment made in the course of preparations and coordination was not considered, which takes quite some investment both in terms of time and human resources.
In 2013 GMA offered three (3) group courses, where 50 people were gathered from 25 countries. They were metrologists and/or calibration/testing officers. It is noteworthy that 64% of them had advanced academic degrees (32 people having their MSc and PhD degrees). Also, participants were from not only the developing world but also from advanced NMIs.

GMA offered three group courses in 2014. The number of participants, 62, increased by 24% from its first year’s achievement. Such a significant achievement results from the newly joined countries from Africa, Mideast and South America such as Botswana, Egypt, Saudi Arabia, Trinidad and Tobago, and UAE. While participants from Asia remains stable with 36 in 2014, high rises were reported from the African countries (10 to 15), Mideast (1 to 7), and South America (2 to 4), respectively. However, the participating countries from those regions still remains to be slightly over 10. GMA is going to promote its awareness for NMIs and RMOs in those regions so that more people over wider metrology communities could come and enjoy the benefits of the unique programs of HRD in metrology offered by GMA.
In 2013, the first year of operation, GMA offered three group courses accommodating 50 participants. The first one was a training workshop jointly organized by KRISS and UNIDO with the financial support shared by the two partners. The workshop dealt with three different subjects of length, mass, and thermometry/humidity so that participants could choose one subject during the intensive laboratory sessions. Other two courses were run by KRISS and each of them was focused on one specific field of metrology: electricity/magnetism and chemistry, respectively.

<table>
<thead>
<tr>
<th>Course</th>
<th>Subjects/Modules</th>
<th>Dates</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIDO-KRISS Workshop 4</td>
<td>Length, Mass, Thermometry/Humidity</td>
<td>April 14 – 26, 2013</td>
<td>14</td>
</tr>
<tr>
<td>GMA-GT-2013-01</td>
<td>Voltage and current, DC resistance, High voltage/current and power, Magnetic field</td>
<td>June 23 – July 4, 2013</td>
<td>19</td>
</tr>
<tr>
<td>Electricity and Magnetism</td>
<td>Gas analysis, Bio analysis</td>
<td>September 2 – 13, 2013</td>
<td>17</td>
</tr>
<tr>
<td>GMA-GT-2013-02</td>
<td>Organic analysis, Inorganic analysis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each course includes MiG (metrology in general) session. Laboratory sessions consist of technical lectures and corresponding hands-on practices.
GROUP COURSES 2013: PROGRAM OVERVIEW

Participants: 19 people from 16 countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Institution</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>NML-BSTI</td>
<td>Asia</td>
</tr>
<tr>
<td>China</td>
<td>NIM</td>
<td>Asia</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>SCL</td>
<td>Asia</td>
</tr>
<tr>
<td>Indonesia</td>
<td>KIM-LIPPI</td>
<td>Asia</td>
</tr>
<tr>
<td>Iraq</td>
<td>COSQC</td>
<td>Asia</td>
</tr>
<tr>
<td>Japan</td>
<td>NMII</td>
<td>Asia</td>
</tr>
<tr>
<td>Kenya</td>
<td>KEI</td>
<td>Africa</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>NMIE</td>
<td>Africa</td>
</tr>
<tr>
<td>South Africa</td>
<td>NMISA</td>
<td>Africa</td>
</tr>
<tr>
<td>Islam</td>
<td></td>
<td>Mid-East</td>
</tr>
<tr>
<td>Africa</td>
<td></td>
<td>Mid-East</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL**
- **16 countries**
- **19 people**

**Groups**
- **Asia**: 12/9 countries
- **Africa**: 6/6 countries
- **Mid-East**: 1/1 country

**Subjects/Modules**

<table>
<thead>
<tr>
<th>MiG Metrology in General</th>
<th>Subjects/Modules</th>
<th>Time slots allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NSS in Korea, QMS requirements, Uncertainty in measurement</td>
<td>1.5 days (including evaluation)</td>
</tr>
<tr>
<td></td>
<td>Presentation of Action Plans</td>
<td>0.5 day (presentations followed by Q&amp;A)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metrology in EM Electricity &amp; Magnetism</th>
<th>Subjects/Modules</th>
<th>Time slots allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM-01 Voltage and current</td>
<td>High voltage, High current, Power</td>
<td>8.0 days (four modules with two days for each; technical lectures plus hands-on practice)</td>
</tr>
<tr>
<td>EM-02 Resistance and impedance</td>
<td>High voltage, High current, Power</td>
<td></td>
</tr>
<tr>
<td>EM-03 Magnetic field</td>
<td>High voltage, High current, Power</td>
<td></td>
</tr>
</tbody>
</table>

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* Orientation & tour in and vicinity of Daejeon offered on Saturday before opening

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**Metrology in Electricity & Magnetism [GMA-GT-2013-01-EM]**

- **Subjects/Modules**
  - NSS in Korea, QMS requirements, Uncertainty in measurement
  - Presentation of Action Plans
  - EM-01 Voltage and current
  - EM-02 Resistance and impedance
  - EM-03 High voltage, High current, Power
  - EM-04 Magnetic field

**Partitioned regions**
- **Asia**: 12/9 countries
- **Africa**: 6/6 countries
- **Mid-East**: 1/1 country

---

**Participants**
- **19 people from 16 countries**
- **Bangladesh**: NML-BSTI 2
- **China**: NIM 1
- **Hong Kong**: SCL 1
- **Indonesia**: KIM-LIPPI 1
- **Iraq**: COSQC 1
- **Japan**: NMII 1
- **Kenya**: KEI 1
- **Ethiopia**: NMIE 1
- **South Africa**: NMISA 1
- **Korea**: KRISS 2

**Total**
- **16 countries**
- **19 people**

**Groups**
- **Asia**: 12/9 countries
- **Africa**: 6/6 countries
- **Mid-East**: 1/1 country

---

**Notes**
- Refreshment at Dong-Hak-sa Buddhist temple... Could you find an entrance to heaven?
- Intensive Lab Sessions!
- The summer was hot and humid...
- Lotto at the farewell dinner!
- Hi, Mr. Safaa! Don’t be so serious...
GROUP COURSES 2013: PROGRAM OVERVIEW

Participants: 17 people from 12 countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Institute</th>
<th>Participants</th>
<th>Total Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>NIM</td>
<td>2</td>
<td>Korea</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>CMS</td>
<td>1</td>
<td>Mongolia</td>
</tr>
<tr>
<td>Colombia</td>
<td>INM</td>
<td>2</td>
<td>Philippines</td>
</tr>
<tr>
<td>Indonesia</td>
<td>RCChem-LIPI</td>
<td>2</td>
<td>Vietnam</td>
</tr>
<tr>
<td>Japan</td>
<td>NMJJ</td>
<td>1</td>
<td>Sub-TOTAL 11</td>
</tr>
<tr>
<td>Kenya</td>
<td>KEB</td>
<td>1</td>
<td>South Africa</td>
</tr>
<tr>
<td>Malaysia</td>
<td>KIMIA</td>
<td>1</td>
<td>TOTAL 17</td>
</tr>
</tbody>
</table>

- China: Taiwan (2), Mongolia (1)
- Colombia: Philippines (2)
- Indonesia: Vietnam (1)
- Japan: Taiwan (1)
- Kenya: South Africa (1)
- Malaysia: Taiwan (1)

- NMISA: UST Student

Asia: 13/9 countries
Africa: 12/2 countries
South America: 2/1 country

GROUP COURSES 2013: PROGRAM OVERVIEW

**GMA_GT_2013-02-QM**

**Subjects/Modules**

- NSS in Korea, QMS requirements, Uncertainty in measurement
- Presentation of Lab reports
- QM-01: Gas analysis
- QM-02: Bio analysis
- QM-03: Inorganic analysis
- QM-04: Organic analysis

**Time slots allocated**

- 3.5 days (including evaluation)
- 1.0 day (presentations followed by Q&A)
- 5.0 days (four modules with two days for each; technical lectures plus hands-on practice)

* Four modules covering the key subjects of metrology in chemistry were presented.

17025+34=?

QMS for metrologists in chemistry!

**Hola!**
Do you remember what the seven pillars behind you symbolize? 😊

- Organic?
- Inorganic?

The woman power grows stronger in the arena of MiC!

Gentlemen! We were minority by 8:9.
GMA offered three group courses in 2014 where 62 participants came from 21 countries. Under one designated area of metrology, each course offered intensive laboratory sessions composed of detailed technical modules. In consideration of the fact that a lot of developing NMIs are looking for opportunities of human resources development with priority in the basic areas of metrology, GMA continued offering courses with selected subjects from the base units of measurement, including mass and related quantities (MRQ), length and dimensional measurement (LDM), and TH (thermometry and humidity).

<table>
<thead>
<tr>
<th>Course</th>
<th>Subjects/Modules</th>
<th>Dates</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMA-GT-2014-01 MRQ</td>
<td>Mass and Related Quantities</td>
<td>March 10-21, 2014</td>
<td>22 (12 countries)</td>
</tr>
<tr>
<td></td>
<td>mass, density, force, torque, pressure</td>
<td>(2 weeks)</td>
<td></td>
</tr>
<tr>
<td>GMA-GT-2014-02 LDM</td>
<td>Length and Dimensional Measurement</td>
<td>April 7-18, 2014</td>
<td>16 (11 countries)</td>
</tr>
<tr>
<td></td>
<td>Length, angle, gauge block, etc.</td>
<td>(2 weeks)</td>
<td></td>
</tr>
<tr>
<td>GMA-GT-2014-03 TH</td>
<td>Thermometry and Humidity</td>
<td>June 9-20, 2014</td>
<td>24 (16 countries)</td>
</tr>
<tr>
<td></td>
<td>SPRT (contact) Thermometry;</td>
<td>(2 weeks)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radiation (non-contact) Thermometry;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Humidity and Moisture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Course begins with a session of metrology in general (MiG), presenting QMS, uncertainty in measurement, and national standards system. For an effective performance, each laboratory session delivers technical lectures combined with practices to follow.
GROUP COURSES 2014: PROGRAM OVERVIEW

Participants: 22 people from 12 countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Organization</th>
<th>People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>NML-BSTI</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Philippines</td>
<td>2</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>SCL</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Vietnam</td>
<td>2</td>
</tr>
<tr>
<td>Indonesia</td>
<td>KIM-LIPI</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Zambia</td>
<td>1</td>
</tr>
<tr>
<td>Kenya</td>
<td>KEB</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Zimbabwe</td>
<td>1</td>
</tr>
<tr>
<td>Mongolia</td>
<td>MASM</td>
<td>2</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>NMIE (UST student)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Philippines</td>
<td>1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>KIM-LIPI (UST student)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sri Lanka</td>
<td>1</td>
</tr>
<tr>
<td>Korea</td>
<td>KRISS</td>
<td>2</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>NMIE (UST student)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Philippines</td>
<td>1</td>
</tr>
<tr>
<td>Korea</td>
<td>KRISS</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>UST student</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sri Lanka</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>KRISS</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(within KRISS)</td>
<td>7</td>
</tr>
</tbody>
</table>

Sub-Total (from abroad): 9 Countries 15 People
Sub-Total (within KRISS): 3 Countries 7 People

TOTAL: 12 countries 22 people

Asia: 16/8 countries
Africa: 6/4 countries

KRISS: newly recruited researchers

GROUP COURSES 2014: PROGRAM OVERVIEW

GMA_GT_2014-01-MRQ

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Time slots allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metrology in General</td>
<td>2.5 days (including evaluation)</td>
</tr>
<tr>
<td>Presentation of Action Plans</td>
<td>0.5 day (presentations followed by Q&amp;A)</td>
</tr>
<tr>
<td>MRQ-01. Mass</td>
<td>6.5 days (technical lectures plus hands-on practice, wrap-up discussion)</td>
</tr>
<tr>
<td>MRQ-02. Density</td>
<td></td>
</tr>
<tr>
<td>MRQ-03. Pressure</td>
<td></td>
</tr>
<tr>
<td>MRQ-04. Force and Torque</td>
<td></td>
</tr>
</tbody>
</table>

Intensive Laboratory Session (Mass, Density)
Intensive Laboratory Session (Pressure)
Intensive Laboratory Session (Force, Torque)
KRISS GMA choir singing "A-ri-rang," a traditional love song of Korea~
Carpe-diem! Never say good-bye, it's just for a farewell~
GROUP COURSES 2014: PROGRAM OVERVIEW

Metrology in Length & Dimensional Measurement [GMA-GT-2014-02-LDM]

Participants: 16 people from 11 countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Institution</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>NML-BSTI</td>
<td>2</td>
</tr>
<tr>
<td>China</td>
<td>NIM</td>
<td>1</td>
</tr>
<tr>
<td>Egypt</td>
<td>NIS</td>
<td>2</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>SCL</td>
<td>1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>KIM-LIPI</td>
<td>2</td>
</tr>
<tr>
<td>Kenya</td>
<td>KEBS</td>
<td>1</td>
</tr>
<tr>
<td>Korea</td>
<td>KRISS</td>
<td>1</td>
</tr>
<tr>
<td>Malawi</td>
<td>MBS</td>
<td>1</td>
</tr>
<tr>
<td>UAE</td>
<td>EMI</td>
<td>2</td>
</tr>
<tr>
<td>Vietnam</td>
<td>QUATEST 3</td>
<td>1</td>
</tr>
<tr>
<td>Zambia</td>
<td>ZABS</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Sub-TOTAL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 Countries</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 People</td>
<td></td>
</tr>
</tbody>
</table>

Asia 8/6 countries
Africa 4/3 countries
Mid-East 4/2 countries

* KRISS: newly recruited researchers

GROUP COURSES 2014: PROGRAM OVERVIEW

GMA_GT_2014-02-LDM

Subjects/Modules

- MiG. Metrology in General
- Presentation of Lab Reports & Action Plans
- Evaluation Test
- Metrology in LDM
- Length and Dimensional Measurement
  - LDM-01: Length standards
  - LDM-02: Angle, Straightness, Flatness, Squareness
  - LDM-03: Gauge block, EDM
  - LDM-04: Length measuring instruments
  - LDM-05: Surface texture, Laser dimensional measurement

Time slots allocated

- 2.5 days (including evaluation)
- 1.25 days (presentations followed by Q&A)
- 0.25 day
- 5.5 days (technical lectures plus hands-on practice, individual lab visits)

“Quo Vadis, NSS!”

“For whom to measure the angles?”

“Make certain uncertainty in your measurements!”

“Take care! No one be missed ^*^”
**GROUP COURSES 2014: PROGRAM OVERVIEW**

**Metrology in Thermometry & Humidity [GMA-GT-2014-03-TH]**

### Participants: 24 people from 16 countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botswana</td>
<td>BOBS 1</td>
</tr>
<tr>
<td>South Africa</td>
<td>NAISA 1</td>
</tr>
<tr>
<td>Colombia</td>
<td>INM 2</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>MUSSD 1</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>SCL 1</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>TIBS 2</td>
</tr>
<tr>
<td>Indonesia</td>
<td>KIM-LJPI 1</td>
</tr>
<tr>
<td>UAE</td>
<td>EMI 1</td>
</tr>
<tr>
<td>Malawi</td>
<td>MBS 1</td>
</tr>
<tr>
<td>Vietnam</td>
<td>QUATEST 3</td>
</tr>
<tr>
<td>Philippines</td>
<td>NML-TTDI 2</td>
</tr>
<tr>
<td>Zambia</td>
<td>ZABS 2</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>GSO-GCC 1</td>
</tr>
<tr>
<td>Egypt</td>
<td>NIS (Ph.D student) 1</td>
</tr>
<tr>
<td>Mongolia</td>
<td>MASM 1</td>
</tr>
<tr>
<td>Korea</td>
<td>KRISS (UST student) 1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>KIM-LJPI 1</td>
</tr>
<tr>
<td><strong>Sub-TOTAL</strong></td>
<td><strong>Countries</strong> 18</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>People</strong> 20</td>
</tr>
<tr>
<td><strong>from abroad</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Countries</strong></td>
<td><strong>People</strong> 13</td>
</tr>
<tr>
<td><strong>within KRISS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Countries</strong></td>
<td><strong>People</strong> 4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>Countries</strong> 16</td>
</tr>
<tr>
<td><strong>People</strong></td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>12/7</td>
</tr>
<tr>
<td>Africa</td>
<td>5/4</td>
</tr>
<tr>
<td>Mid-East</td>
<td>3/3</td>
</tr>
<tr>
<td>South America</td>
<td>4/2</td>
</tr>
</tbody>
</table>

**Subjects/Modules**

<table>
<thead>
<tr>
<th>Subjects/Modules</th>
<th>Time slots allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>MiG</td>
<td>2.5 days (including evaluation)</td>
</tr>
<tr>
<td>Presentation of Action Plans</td>
<td>0.5 day (presentations followed by Q&amp;A)</td>
</tr>
<tr>
<td>TH-01, SFRT Thermometry</td>
<td>6.5 days (technical lectures plus hands-on practice, Individual lab visits for wrap-up discussion)</td>
</tr>
<tr>
<td>TH-02, Radiation Thermometry</td>
<td></td>
</tr>
<tr>
<td>TH-03, Humidity and Moisture</td>
<td></td>
</tr>
</tbody>
</table>

*Practice makes perfect!*  
There is no royal road to learning uncertainty!

**While in Korea, do as Koreans do!**  
*Yumi's ho-eun "bi-bim-bap" the steamed rice mixed with collections of fresh vegetables, savored with sesame oil and red-pepper paste!*

**2014 FIFA World Cup Brazil!**  
Another group of early birds getting together at KRISS in support of the Korean national team vs Russia!
### INDIVIDUAL COURSES 2013: OVERVIEW

<table>
<thead>
<tr>
<th>Areas</th>
<th>Countries</th>
<th>Employers</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>(number of participants)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>Lithuania</td>
<td>Vilnius Gediminas Technical University</td>
<td>Mar 31 - Jun 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(9 weeks)</td>
</tr>
<tr>
<td>Length</td>
<td>Pakistan</td>
<td>National Physical and Standards Laboratory (NPSL)</td>
<td>Jun 3 - Jun 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2 weeks)</td>
</tr>
<tr>
<td>Thermometry</td>
<td>Syria</td>
<td>National Standards and Calibration Laboratory (NSCL)</td>
<td>Jun 30 - Jul 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2 weeks)</td>
</tr>
<tr>
<td>Gas Analysis</td>
<td>Singapore</td>
<td>National Metrology Center, A<em>STAR (NMC/A</em>STAR)</td>
<td>Jun 30 - Aug 31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(9 weeks)</td>
</tr>
<tr>
<td>Length</td>
<td>Lithuania</td>
<td>Vilnius Gediminas Technical University</td>
<td>Oct 1 - Nov 30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(9 weeks)</td>
</tr>
<tr>
<td>Fluid Flow</td>
<td>The Philippines</td>
<td>National Metrology Laboratory – ITDI (NML-Phil)</td>
<td>Nov 3 - Nov 16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2 weeks)</td>
</tr>
<tr>
<td>Acoustics &amp; Vibration</td>
<td>Vietnam</td>
<td>Vietnam Metrology Institute (VMI)</td>
<td>Nov 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(24 weeks)</td>
</tr>
</tbody>
</table>

Beneficiaries of individual courses include Nine (9) people from six (6) countries. Individual courses accumulated 61 person-weeks in five areas of physical metrology.

While the GMA's group courses are a sort of ready-made short-term programs open to any customers, the individual course programs are tailored so as to meet the specific needs of individual customers for capacity building in metrology. Therefore, the individual course programs have been strategically designed through close prior communications between the customers and the chief lecturers at KRISS. It is to get the programs refined in order to create most appropriate solutions to the technical problems that the customers are faced with. In the first year of its operation, GMA offered services of individual programs upon the request of nine (9) customers covering five (5) areas of physical metrology for up to 61 person-weeks.

### INDIVIDUAL COURSES 2014: OVERVIEW

<table>
<thead>
<tr>
<th>Areas</th>
<th>Countries</th>
<th>Employers</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>(number of participants)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>Lithuania</td>
<td>Vilnius Gediminas Technical University</td>
<td>Jan 8 – May 30,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(21 weeks)</td>
</tr>
<tr>
<td>Electricity</td>
<td>Malaysia</td>
<td>National Metrology Laboratory (NML)- SIRIM</td>
<td>May 1 - Aug 31,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(18 weeks)</td>
</tr>
<tr>
<td>Magnetism</td>
<td>Malaysia</td>
<td>National Metrology Laboratory (NML)- SIRIM</td>
<td>May 1 - Aug 31,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(18 weeks)</td>
</tr>
<tr>
<td>Thermometry</td>
<td>South Africa</td>
<td>National Metrology Institute of South Africa (NMISA)</td>
<td>June 23 - July 5,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2 weeks)</td>
</tr>
<tr>
<td>Length</td>
<td>Lithuania</td>
<td>Vilnius Gediminas Technical University</td>
<td>Oct 1 – Dec 31,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(14 weeks)</td>
</tr>
<tr>
<td>Fluid Flow</td>
<td>Malaysia</td>
<td>National Metrology Laboratory (NML)- SIRIM (<em>To be confirmed</em>)</td>
<td>Nov 10 – Nov 21,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2 weeks)</td>
</tr>
<tr>
<td>Ionizing Radiation</td>
<td>Indonesia</td>
<td>BATAN</td>
<td>Dec 1-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.5 weeks)</td>
</tr>
</tbody>
</table>

GMA likely to accept ten (10) people from four (4) countries for 85.5 person-weeks covering fundamental areas of metrology. GMA’s individual program has room for improvement ready to explore and enough to offer more opportunities for more customers. It is likely that GMA could accept ten (10) people for their individual studies at KRISS in 2014. As the individual programs have been initiated upon request made by customers, it has room for further improvement so that more customers might be given more opportunities to enjoy the custom-tailored programs at KRISS. Therefore, customers and readers are much more than welcome to offer advice to and share ideas with GMA on how to make it better for both of the customers and KRISS lecturers.
INDIVIDUAL COURSES
Tailored to meet the specific needs of our partners

For experimental research required to work out her doctoral dissertation, Ms. Lauryna has come to KRISS flying quite a long distance from Lithuania. Having successful collaborations with her partners, including Dr. Ho Suhng Suh at the Center for Length, of KRISS it is envisaged that she is given her doctoral degree from Vilnius Gediminas Technical University, Lithuania in early 2015.

In order to dedicate herself to broadening the scope of services, Ms. Nguyen Thi Hang from Vietnam Metrology Institute (VMI) studied at KRISS for around six months beginning in November 2013. Her staying at KRISS brought her to be away from her lovely family members for such a long period of time. However, no one can deny that it will surely be of great resource for her and VMI in exploring and expanding their customers by being ready to meet the needs of quality measurement services.

To be properly responding to the emerging needs of measurement services from wide sectors of customers, NMIs are supposed to secure its corresponding calibration and measurement capabilities (CMCs). Ms. Li Hou from the National Metrology Centre (NMC) of A*STAR, the NMI of Singapore, came to KRISS in 2013 for a mission of building up NMC’s measurement capability in gas analysis. Her study at the Center for Gas Analysis of KRISS was tailored with emphasis on preparation and analysis of an environmental gas, CH₄. GMA’s individual course offered for one staff of NMC helped a lot for NMC to be better responding to the needs of gas analysis.

Mr. Sven du Clou was employed by the National Measurement Institute of South Africa (NMISA) in Feb 2014 after obtaining his master’s degree in 2013. His career as metrologist began with an assignment from the NMISA to learn the knowledge and skill of the calibration of SPRT, standard platinum resistance thermometer. He brought with him two sets of SPRTs for calibration at KRISS. Under the guidance of and in close collaboration with his partners at the Center for Thermometry of KRISS, Mr. Sven was given customized program of learning, from A to Z, how to offer calibration services of the SPRT. His individual study for two (2) weeks, combined with a GMA’s group course of metrology in thermometry and humidity for two weeks, served him a great deal in promoting the effectiveness of his study in the beginning of his career as metrologist.

GMA individual programs, enabling beginners to be competent metrologists!
KRISS-UST GRADUATE SCHOOL OF METROLOGY

As of Jul 2014

<table>
<thead>
<tr>
<th>Graduates</th>
<th>Doctoral course</th>
<th>Master's course</th>
<th>Total</th>
<th>From NMI (&amp; DI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Progress</td>
<td>12</td>
<td>4</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>11</td>
<td>30</td>
<td>23</td>
</tr>
</tbody>
</table>

UST, the University of Science and Technology of Korea is a graduate school founded in 2002, jointly operated with the participation of 30 government-funded research institutes (GRIs) of Korea. The UST features its unique system of forming curricula that might be designed by students and their supervisors so as to get them fit for the needs of students. Different from other graduate schools in Korea, the UST students are allowed to name their majors representing the contents of what they are going to learn by their curricula.

Since 2005 KRISS has been accepting students under the programs of KRISS-UST graduate school of metrology. As of July 2014, there are 16 students who are in progress of their studies at KRISS. In addition, 14 students successfully completed their studies obtaining their master's (7) and doctoral (7) degrees in measurement sciences.

Cutting-edge research facilities and professional research scientists at KRISS and GRIs, coupled with harmonized learning of knowledge and corresponding experimental techniques, construct the core competitiveness of UST. Students are provided with financial support from the host GRIs to cover their tuitions and living expenses. All of these have led to the unique merit of UST attracting a growing number of students coming from all of the globe. KRISS newly accepted nine (9) students for the recent two years. For more information about this, please visit www.ust.ac.kr.

OUTREACH SERVICES

Currently, GMA’s programs of metrology HRD have been offered at the laboratories of KRISS in Korea. It is worthy to note that GMA also carries an attractive portfolio of outreach service to be offered on site of its customers. Upon request of customers, GMA is ready to offer services on site of customers abroad. The competitive advantages that customers could enjoy with the outreach services include, among others, its wide coverage of services. The GMA programs offered at KRISS are primarily focused on technical capability of the customers. The outreach services could instead take a more comprehensive approach, ranging from diagnosis to prescriptions, dealing with not only technical but also strategic issues to which the customers expect to find solutions to. Activities of the outreach services therefore consist of fact-finding survey, lectures, training and technical advice. Beneficiaries of the outreach service will not merely stay with a few but spread widely over the national metrology community of the customers.

Competitive Advantages of Outreach Services

- Comprehensive Approach
  - From Diagnosis
  - To Prescriptions

- Diverse Activities
  - Fact-finding Survey
  - Lectures and advice
  - Technical Training

- Wide Range of Beneficiaries
  - Nationwide Community of Metrology
  - NMI, Calibration/Testing Labs, Government, etc.
### Key Outputs and Potential Applications

#### Potential applications of outputs

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Potential Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Laboratory/Country Reports</strong></td>
<td>• Sharing information about measurement service problems faced by the participating NMIs</td>
</tr>
<tr>
<td></td>
<td>• Identifying areas/subjects of future collaborations between the participants and the host institute</td>
</tr>
<tr>
<td><strong>Actions Plans</strong></td>
<td>• Finding solutions to come over the problems faced by individual NMIs</td>
</tr>
<tr>
<td></td>
<td>• Setting up strategic development plan of participating NMIs in terms of people, equipment and QMS</td>
</tr>
<tr>
<td></td>
<td>• Sharing knowledge and experience of how to raise awareness of metrology and the role of NMIs</td>
</tr>
<tr>
<td></td>
<td>• Obtaining ideas of raising investment in metrology and NMIs over wider sectors of stakeholders</td>
</tr>
<tr>
<td><strong>Effective Training programs</strong></td>
<td>• More effective program was developed, covering:</td>
</tr>
<tr>
<td></td>
<td>✓ Key technical subjects of physical metrology and metrology in chemistry; and metrology in general</td>
</tr>
<tr>
<td></td>
<td>✓ Intensive Laboratory Sessions (ILS) were refined in ways that technical lectures and practice could be well combined.</td>
</tr>
<tr>
<td><strong>Lecture Materials</strong></td>
<td>• Both of hard copies and electronic files were provided to all participants so that they could be used as reference for their advanced services at laboratories and on sites of services.</td>
</tr>
<tr>
<td><strong>Feedback from Participants</strong></td>
<td>• Comments by participants were of great value for higher effectiveness of GMA courses in various aspects of its program:</td>
</tr>
<tr>
<td></td>
<td>✓ To be focused more on practice;</td>
</tr>
<tr>
<td></td>
<td>✓ To place more days on intensive laboratory sessions (ILS); and</td>
</tr>
<tr>
<td></td>
<td>✓ To develop advanced courses dealing with one subject area in depth.</td>
</tr>
<tr>
<td></td>
<td>• Providing justifications of metrology HRD projects for the sustainable growth of the developing worlds through building up their trade capacity to be competitive in global markets.</td>
</tr>
</tbody>
</table>

### In Pursuit of Higher Performance through problem-solving approach

In order to create better customer value, GMA sets the primary principle of its operation at producing higher performance in its programs. To make it reality, GMA takes problem-solving approach in operating its programs. Participants in group and individual courses are asked to draw up their laboratory reports and draft action plans in advance of coming to attend the courses. Their reports should clearly states the technical problems they are faced with. Based on the analysis of all reports, lectures and practices might be modified so as to best meet the needs of participants, which will then lead to high satisfaction of and better value for customers.

- **Analysis of Lab Reports**
  - Written by ALL participants
  - Analyzed by GMA
  - Needs/Problems identified
  - Practices rearrangements ➔ to best meet practical needs

- **Effective Learning**
  - Lectures (AM) + Practice (PM)

- **Individual Lab Visits Added**
  - On the last day of each group course, following wrap-up discussion
  - Individual participants visit laboratories of further interest

- **Lectures & Practices PLUS Individual Lab Visits**

- **Action Plans**
  - Draft action plans written by ALL participants before the course
  - Obtaining advice of the lecturers during the course
  - ALL participants are refining their Action Plans to be more substantial/practical

- **Substantial Action Plans Developed**
The diagram below presents the activity composition of a group course that GMA offered in 2014, with the proportion of time allocation to each activity. Lectures and hands-on exercises are well harmonized. Participants in the course start their study before coming to the course. They were requested to write the lab reports and draft action plans as detailed as possible. Among others, they were asked to identify technical problems they were faced with. Lab reports should include descriptions on the measuring instruments they wanted to practice with during the hands-on sessions. Laboratory sessions were adjusted accordingly so as to accommodate such practical needs of customers as much as possible. The overall customer satisfaction has recorded higher than 4.5/5.0 for all of the group courses offered by GMA. It is obvious that GMA’s effort to create better customer value through higher performance will grow stronger.

Congratulations for the birth of GMA on-line news, I am sincerely waiting for the moment it is issued and I’m sure it will be as genuine as everything in KRISS. Wish the Best of Luck, Ms. Dalia Zahwi, NIS, Egypt
GMA pursues to be a most productive & friendly partner for HRD in metrology in the spirit of sharing the fruits of shared efforts!

GMA group courses 2015 will soon be announced around the end of September 2014. Stay in tune!

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