

## Hong Kong, China

### Current Developments in Legal Metrology

In Hong Kong, different government departments assume different roles in the operation of legal metrology.

#### Government Laboratory

##### **(I) Statutory functions**

1. The Government Laboratory (GL) is entrusted with the statutory role to provide analytical and advisory services to government departments to support the enforcement of regulations related to public health and safety, environmental protection, consumer rights, protection of government revenue and criminal justice.

##### **(II) Scope of Service**

2. The GL is equipped with an array of state-of-the-art equipment and provides comprehensive analytical service to government departments in the analysis of food, pharmaceutical products, Chinese medicine, dangerous goods and consumer products for the protection of public health and safety. The GL also provides technical support for the implementation of government environmental policies and initiatives. .
3. The GL provides comprehensive forensic scientific service to the Criminal Justice System in Hong Kong, covering questioned documents, toxicology and controlled drugs examination, as well as chemical, biochemical, and physical examination of evidence.

##### **(III) Metrology**

4. The GL is a designated institute in the field of Metrology in Chemistry for Hong Kong, China under the CIPM MRA, and has the responsibility for
  - a) promoting the awareness of metrology in chemistry;
  - b) ensuring that measurement standards maintained are traceable to standards maintained at or coordinated by the International Bureau of Weights and Measures (BIPM) in the realisation of the international system (SI) of units; .
  - c) dissemination of traceability of measurement to field laboratories..
5. In the year 2009, GL organized a series of proficiency testing programmes for both local and overseas chemical laboratories. Two programmes targeted for local laboratories, and three programmes are in collaboration with the Hong Kong Accreditation Service (HKAS) under the auspices of Asia Pacific

Laboratory Accreditation Cooperation (APLAC). In 2010, GL will organize four PT programmes including two international programmes and two programmes in collaboration with HKAS under the auspices of APLAC, (as shown in table):

<b>PT Programme</b>	<b>Code</b>	<b>Number of Participants</b>	<b>Completion</b>
Polycyclic Aromatic Hydrocarbons in Sediment	APLAC T068	58	May 2009
Food Safety Testing - Melamine in fish feed	APLAC T069	52	Aug 2009
Food Safety Testing - Melamine in milk	APLAC T071	76	Nov 2009
Food Safety Testing - Sudan dyes in chilli powder	HKGL 0904*	11	Early 2010
Food Safety Testing - Organochlorine pesticides in green tea	HKGL 0903*	8	Early 2010
<b>PT programmes to be organized in 2010</b>			
Forensic Science Testing – Ketamine in hair	GLHK 1001#	-	Commenced in April 2010
Food Safety Testing – Heavy metals in crustacean seafood	GLHK 1002#	-	Commenced in May 2010
Environmental Testing – PAH in sediment	APLAC T078	-	Commenced in August 2010
Food Safety Testing – Essential and trace elements in bovine liver	APLAC T077	-	Will be commenced in October 2010

Note: \* Local Programmes, # International Programmes

6. To ensure equivalence of measurement with other metrology institutes, the GL has participated actively in international comparisons and studies, three of which were organized by the Consultative Committee on Amount of Substance (CCQM) of the International Bureau of Weights and Measures (BIPM) and three by the Asia Pacific Metrology Program (APMP). They were CCQM-K75 & P118: toxic metals in algae and CCQM-K81: chloramphenicol in pig muscle, APMP.QM-K9: pH measurement, APMP.QM-P14: benzoic acid and sorbic acid in curry paste respectively. The results obtained by the GL were in good agreement with the findings of the leading national metrology institutes. Six new Calibration and Measurement Capabilities (CMC) claims made by GL have been included in Appendix C of the Key Comparison Database (KCDB) under the Mutual Recognition Arrangement of the International Committee for Weights and Measures (CIPM MRA) in 2009.

7. In 2009, GL collaborated with the National Measurement Institute, Australia (NMIA) and the National Institute of Metrology, China (NIM, China) in organization of a pilot study on pesticide in tea for APMP (APMP.QM-P15) and a proficiency testing programme for members of APMP's developing economies. In September 2009, GL became the first proficiency testing provider accredited by Hong Kong Accreditation Service and its scope of work covers Chinese medicine, environmental and food testing. Also, a colleague from GL, Dr. Della WM Sin (Chief Chemist), was elected the Chairman of the Technical Committee on Amount of Substance (TCQM) of APMP in December 2009. Certainly, with this new designation, GL is in a better position to help build the local and regional metrology in chemistry infrastructure and demonstrate GL's commitments to scientific excellence of our economy.

#### **(IV) International Technical Cooperation**

8. As in previous years, in 2009, the GL actively participated in overseas conferences, workshops, and meetings organized by various metrology organizations such as the APLMF, APMP and BIPM for operational needs and for experience sharing. The GL also received 68 visitors and experts from Mainland China, Korea, Singapore, Thailand and the United Kingdom for exchanges.

#### **(V) Future Plan**

9. The GL will continue to take an active role in activities related to metrology in chemistry, and organize inter-comparison programmes to promote comparability of measurements and disseminations of measurement traceability. Besides, GL is planning to seek accreditation in 2010 as a reference materials provider and produce reference materials that are needed by the local testing industry but are not available in the market. Among others, GL is preparing three reference materials for the accreditation exercise in 2010, namely, for trace elements in herbal medicine, pesticides in tea and melamine in milk, all of which are needed by the testing community.

### **Standard Calibration Laboratory**

#### **(I) Laboratory Related Matters**

##### **Developments specific to the laboratory**

1. The Government of the Hong Kong Special Administrative Region Standards and Calibration Laboratory (SCL) is responsible for:
  - (a) developing and maintaining Hong Kong's reference standards of physical measurements, metrologically traceable to the International System of Units (SI);

- (b) providing a traceable calibration service to serve Hong Kong's needs; and
  - (c) promoting international acceptance of Hong Kong's measurement standards and calibration certificates issued by SCL through mutual recognition arrangement.
2. To keep up with international developments in measurement standards and to meet Hong Kong's demand for new and improved calibration services, SCL has been upgrading its measurement standards and calibration facilities as well as improving its calibration and measurement capabilities. The progress of SCL's major development projects / initiatives is summarised below:
- (a) SCL has developed a calibration service for 1-inch working grade microphones by comparison method in accordance with the international standard IEC 61094-5.
  - (b) SCL has developed calibration services for blackbodies and radiation thermometers at 0 °C by comparison with an ice point blackbody cavity.
  - (c) SCL has extended its upper temperature calibration capability for temperature chambers from 100 °C to 300 °C.
  - (d) SCL has developed calibration services for RF voltage sources/meters with 75  $\Omega$  impedance.
  - (e) SCL has set up a primary standard for AC power and developed calibration services for high precision 3-phase power and energy meters.
  - (f) SCL has developed calibration services for power quality instruments, including harmonic sources/meters and flicker sources/meters.
  - (g) SCL has developed a calibration capability for small angle generators ranging  $\pm 600$  arc second.
  - (h) SCL has developed calibration service for nano-step standards of height up to 1000 nm with an expanded measurement uncertainty of 2 nm. A laser interferometer is being integrated with the AFM to facilitate metrological traceability to SCL's primary standard for the realisation of the SI base unit of "metre".
  - (i) SCL is in the process of developing calibration capability for Gauss meters for the range of 3-500 Gauss, and also another range of 500 Gauss to 1.5 T.
  - (j) SCL is in the process of setting up air velocity calibration service from 0.1 m/s to 35 m/s. The equipment used will be a laser

Doppler anemometer and a wind tunnel.

- (k) SCL is in the process of extending its volume calibration service for piston-pipette from 10  $\mu$ l down to 1  $\mu$ l.
- (l) SCL has planned for setting up a build-up system which comprises three 3-MN load cells. The build-up system is aimed at extending SCL's force calibration capability up to 9 MN in order to satisfy the industrial need for high capacity force calibration.
- (m) To disseminate measurement knowledge to industry, SCL and HKAS jointly organised short metrology training courses in December 2009 and July 2010 for outside laboratory personnel engaged in equipment calibration. Trainers were provided by SCL. The courses covered topics on SI units, metrological traceability, measurement uncertainty, standards and their dissemination as well as digital multimeter, mass, dimension, temperature and humidity calibrations. Due to the good responses, more courses will be organised and the next course is planned for December 2010.

#### **Laboratory/equipment status and capabilities**

- 3. SCL has set up measurement standards and calibration facilities in the following measurement fields: direct current, low frequency, radio frequency/microwave, time and frequency, acoustics, temperature, humidity, dimension, mass, volume, density, pressure, hardness, rotational speed, torque and force. Its full range of calibration services is outlined in a brochure entitled "Calibration Services" on the website <http://www.itc.gov.hk/scl>. The calibration services are accredited by HKAS with the scope of accreditation and the best measurement capabilities set out in the HOKLAS Directory of Accredited Laboratories on the website <http://www.itc.gov.hk/hkas>.

#### **Laboratory key staff**

- 4. The key staff of SCL and their roles as the contact persons of the various APMP Technical Committees are as follows:

<u>Name</u>	<u>Position</u>	<u>Tel</u>	<u>Email</u>
Mr. K.S. Chiang	Head of Laboratory	(852) 28294829	kschiang@itc.gov.hk
Mr. Dennis W.K. Lee	Senior Electronics Engineer [Contact Person of TCEM and TCPR]	(852) 28294833	wklee@itc.gov.hk
Mr. Y.K. Yan	Senior Electronics Engineer [Contact Person of TCAUV]	(852) 28294848	ykyan@itc.gov.hk

Mr. M.C. Yuen	Senior Electrical and Mechanical Engineer, Quality Manager [Contact Person of TCQS]	(852) 28294839	mcyuen@itc.gov.hk
Mr. Johnny C.Y. Poon	Electronics Engineer (Low Frequency)	(852) 28294855	cypoon@itc.gov.hk
Mr. C.M. Tsui	Electronics Engineer (Radio Frequency)	(852) 28294850	cmtsui@itc.gov.hk
Ms. Brenda H.S. Lam	Electronics Engineer (Direct Current)	(852) 28294832	hslam@itc.gov.hk
Mr. Julian C.P. Cheung	Electronics Engineer (Temperature/Humidity)	(852) 28294842	cpcheung@itc.gov.hk
Mr. T.K. Chan	Electrical and Mechanical Engineer (Mass & Related) [Contact Person of TCM and TCL]	(852) 28294835	tkchan@itc.gov.hk
Dr. S.Y. Wong	Electrical and Mechanical Engineer (Dimension)	(852) 28294805	sywong@itc.gov.hk

## **(II) International Technical Cooperation**

- Laboratory visits are a useful means to keep abreast of metrology developments in other NMIs, exchange technical information, share experience and promote mutual understanding/co-operation. During the last APMP General Assembly and Technical Committee Meetings held in Kuala Lumpur, Malaysia, in December 2009, two staff of SCL participated in the laboratory visit to the National Metrology Laboratory (NML) of the Standards and Industrial Institute of Malaysia (SIRIM). During the 9<sup>th</sup> Asia-Pacific Symposium on Measurement of Mass, Force and Torque (APMF) 2009 in June 2009, a staff visited the mass, force and torque laboratories of the National Metrology Institute of Japan (NMIJ). In August 2009, a staff visited the National Institute of Metrology (NIM) of China to familiarize with photometric and magnetic measurement work at NIM. In April 2010, a staff member visited the National Metrology Institute of Japan (NMIJ) to participate in the CCL-K11 Laser Comparison.
- To keep abreast of international metrology developments, staff of SCL participated in the following symposium/conference/seminar:

### Symposium/Conference/Workshop

APMP SAPMP Symposium

16 December 2009

7. SCL received the following visitors from another NMI:

Visitor to SCL

Dr. Jin Dr Jin Wan CHUNG, Head, Center for Mass  
& Force Metrology, KRISS

17 July 2009

8. The following peers from other NMIs, who were appointed by HKAS as technical assessor, visited SCL to conduct HOKLAS assessments:

<u>Measurement Field</u>	<u>Peer Assessor</u>	<u>Date</u>
Direct Current, Low Frequency and Quality System	Professor Lu Zuliang, NIM of China	12 – 15 October 2009
Radio Frequency/ Microwave, Time and Frequency	Dr. Shan Yue Yan, A*STAR of Singapore	27-28 October 2009

9. SCL is represented on various APMP Technical Committees as set out in paragraph 4 above.

**(III) Matters Concerning the CIPM MRA**

10. SCL has been representing Hong Kong, China, as an Associate of the CGPM since April 2000. It has been a signatory of the CIPM MRA since May 2000 and authorised by BIPM in September 2006 to use the CIPM MRA logo in its calibration certificates. Such calibration certificates are internationally recognised by 211 NMIs / designated institutes in 75 economies and 3 international organisations.

**Inter-laboratory comparisons**

11. SCL participated in the following inter-laboratory comparisons of measurement standards:

<u>Comparison</u>	<u>Date of SCL measurement</u>
(a) BIPM CCTF Reference Time Scale UTC (Coordinated Universal Time) Comparison (CCTF-K001.UTC)	Ongoing

- |  |                        |
|--|------------------------|
| (b) APMP Sound Calibrator Comparison<br>(APMP.AUV.A-S1)                | October 2008           |
| (c) APMP Gold-Platinum Thermocouple<br>Comparison<br>(APMP.T-S5)       | November/December 2008 |
| (d) CCL Laser Comparison<br>(CCL-K11)                                  | April 2010             |
| (e) APMP Hardness Comparison<br>(APMP.M.H-S3)                          | August 2010            |
| (f) APMP Comparison of DC voltage<br>standards<br>(APMP.EM.BIPM-K11.3) | August 2010            |

#### **Status of management system**

12. SCL's management system conforms to the international standard "ISO/IEC 17025 - General Requirements for the Competence of Testing and Calibration Laboratories". SCL has been formally accredited by HKAS since August 2001 for compliance with the requirements of the international standard ISO/IEC 17025. Following a reassessment of SCL's management system by an overseas peer assessor appointed by HKAS in October 2009, accreditation was reaffirmed.
13. As an annual exercise, SCL has conducted internal quality audits on the management and technical aspects of its operations in June 2010 as well as a management system review in September 2010 to ensure effectiveness of its management system and compliance with the requirements of ISO/IEC 17025. SCL's Management System Committee has met three times since the last Laboratory Report to consider matters related to management system and quality (including the reports on the internal quality audits and the management system review) with a view to continuous improvements. SCL's quality manual has also been reviewed and updated regularly for continuous improvements and in line with international developments.

#### **Peer reviews**

14. In fulfilment of the CIPM MRA, SCL professional staff assisted the APMP TCQS Chair in 3 reviews on the quality management systems of KRISS (Republic of Korea) for Ionising Radiation and NMIJ (Japan) for Ionising Radiation and Photometry and Radiometry.

#### **Publication of CMCs**

15. As of August 2010, a total of 299 rows of SCL's CMCs are published on the



BIPM website (<http://kcdb.bipm.fr/appendixC/>) for international recognition covering the following measurement fields:

	<u>Measurement Field</u>	<u>Rows of CMCs Published</u>
(a)	Electricity	195
(b)	Time and Frequency	29
(c)	Thermometry	16
(d)	Mass and related quantities	34
(e)	Length	10
(f)	Acoustics	15
	Total:	299

#### **(IV) Activities with APEC**

16. Staff of the Product Standards Information Bureau (PSIB) of the Innovation and Technology Commission represents Hong Kong, China on APEC's Sub-committee on Standards and Conformance. SCL has been working closely with PSIB on APEC issues concerning regional development of physical measurement standards.

#### **(V) Future Plans**

17. SCL will continue to seek cooperation opportunities with other NMIs and to participate, whenever possible, in international symposia, conferences and seminars as well as other activities in metrology.
18. SCL plans to participate in the following inter-laboratory comparisons of measurement standards:

	<u>Comparisons</u>	<u>Schedule for SCL Measurement</u>
(a)	BIPM CCTF Reference Time Scale UTC (Coordinated Universal Time) Comparison (CCTF-K001.UTC)	Ongoing
(b)	APMP comparison of DC voltage standards (APMP.EM.BIPM-K11.3)	In Progress

- |     |  |             |
|-----|--|-------------|
| (c) | APMP Comparison of DC voltage ratios<br>(APMP.EM.K8)                             | To be fixed |
| (d) | APMP Comparison of resistance standards<br>(APMP.EM-K10)                         | To be fixed |
| (e) | APMP Comparison of High Resistance<br>(APMP.EM-K2)                               | May 2011    |
| (f) | APMP standards for DCV, ACV, DCI, ACI and R meters comparison<br>(P1-APMP.EM-S5) | To be fixed |
| (g) | APMP AC Power Comparison<br>(APMP.EM-K5.1)                                       | To be fixed |
| (h) | APMP Infrared Ear Thermometer Blackbody Comparison<br>(APMP-T-S4)                | To be fixed |
| (i) | APMP Low-T Radiation Thermometer Comparison                                      | To be fixed |
| (j) | APMP Absolute Pressure Comparison<br>(APMP.M.P-K9)                               | To be fixed |

19. SCL will develop the following measurement standards and calibration facilities/services:

<u>Facilities/Services</u>	<u>Target Date</u>
(a) Calibration service for mouth simulator	Q3 of 2010
(b) On-site calibration service for large capacity balances up to 200 kg	Q3 of 2010
(c) Calibration service for magnetic flux density for working grade gaussmeter (3-500 G)	Q4 of 2010
(d) Calibration service for magnetic flux density for working grade teslameter (> 500 G to 1.5 T)	Q4 of 2010
(e) Integration of laser displacement	Q4 of 2010

measuring interferometer with atomic force microscope for enhancement of nanometric measurement capability

- |     |   |            |
|-----|---|------------|
| (f) | Calibration service for electrical safety tester  | Q1 of 2011 |
| (g) | Upgrading of calibration service for ESD generators to comply with IEC 61000-4-2:2008 edition               | Q1 of 2011 |
| (h) | Calibration service for voltage dip generators  | Q1 of 2011 |
| (i) | Calibration service for Hemisphere, Diameter with range up to 190 mm  | Q1 of 2011 |
| (j) | Development of calibration service for temperature and humidity measurement for different kinds of chambers | Q1 of 2011 |
| (k) | Calibration service for piston-pipettes down to 1 $\mu$ l   | Q3 of 2011 |
| (l) | Calibration service for anemometers   | Q4 of 2011 |

### **Future Plans**

Hong Kong will continue to seek cooperation opportunities with our international counterparts and to participate, whenever possible, in international conferences, seminars and other activities in measurement standards and metrology.

Consumer Protection Bureau  
Customs and Excise Department  
The Government of Hong Kong Special Administration Region  
September 2010