

Virtual Institute for Metrology in Chemistry: Cost Effective Traceability in Chemical and Biological Measurement

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Introduction

Traceability to common references is one of the foundations of good measurement with results that are consistent between laboratories, countries, and regions. It is a concept well developed in physical measurement but, until recently, had been developed relatively poorly in its support for analytical chemistry. The Measurements Standards Laboratory [MSL - as the NZ National Metrology Institute (NMI)] is developing a Virtual Institute for Metrology in Chemistry (VIMT) as a cost effective approach to make the best use of existing analytical expertise in NZ. It will allow us to join with developing metrological initiatives to support better chemical measurement and maintain the acceptability of local chemical measurements in their role of supporting trade and commerce.

Good measurement requires a system of traceability to link the measured result to both the true result represented as an internationally accepted and defined reference value for the analyte being quantified and an estimation of the uncertainty of this link. Without traceability to a common reference, no-one can have confidence that measurements made on the same sample in different laboratories, different countries, or different regions are consistent. ISO/IEC 17025 is the standard for competence of calibration and testing laboratories and ISO 15189 is that for competence of medical testing laboratories; both require procedures that show traceability of their measurements to these defined references and procedures to estimate the associated uncertainty.

Traceability and uncertainty are well established concepts in physical testing but less well established in chemical and quantitative biological measurement. Analytical chemists and microbiologists are well aware that all measurements have inherent variability with a need for systems to demonstrate consistency in results between laboratories, countries and regions. Resolution 10 of the 21st General Conference on Weights and Measures (1999) recognises a continuing need for improvement in the traceability of chemical measurement because of the importance these measurements have in the facilitating trade. It recommended that NMIs increase their support for this type of testing.

Metrology and the NMIs depend on traceability and uncertainty to provide the link between an individual measurement and the defined international reference. Both are well defined and quantifiable concepts that interpret measurement variability into a form that shows the consistency expected between laboratories and countries when results are reported on equivalent samples.

Traceability in chemical measurement normally depends on the quality of the calibration standard and the appropriateness of any matrix Certified (Standard) Reference Material used during validation, and used as part of any on-going quality control protocol. It may include proficiency testing if the target value and its uncertainty have been estimated in an appropriate manner. In recent years the international community of NMIs, *e.g.* NIST (USA), NARL (Australia), the NMIs in Europe, and NMIJ (Japan), have spent considerable effort in developing a more complete set of certified reference and other materials that better cover the traceability links that apply to chemistry.

NZ has made less progress in developing chemical metrology and a national system of traceability to support chemical measurement. However, this is a development that cannot be ignored if the international community is to maintain full confidence in the national measurement infrastructure for chemical analysis, for its accreditation system, and for trade and commerce. The NZ NMI has little expertise in chemical measurement but it has a legislative mandate to address the development.

In NZ, expertise in chemical measurement is spread between government owned commercial laboratories and research institutes. The economy is too small for the NMI to set up a separate group of experts with skills across all areas of analytical chemistry important to it within the MSL. Thus the MSL has spent time and effort in devising a workable system to unite the existing nationally-dispersed experts with its chemical metrology responsibilities. Discussions have involved input from stakeholders who support a measurement infrastructure and interested laboratory staff through workshops. As a result the NZ Virtual Institute for Metrology in Chemistry has been formed as a cost effective solution. MoRST, as the Government arm responsible for the national measurement standards, has agreed that this is appropriate for traceability in chemical measurement.

The Virtual Institute for Metrology in Chemistry

The VIMC is a model designed to unite the dispersed NZ experts (and sometimes users) into a single web-centred organisation. It will link our expert laboratories to the international measurement infrastructure of the NMIs, to working chemical testing laboratories, and to users of chemical measurement as shown in Fig. 1. This will ensure traceability of the measurements from the working laboratories to the VIMC experts, to other NMIs, and the international measurement system.

In developing the VIMC it has been noted that many of

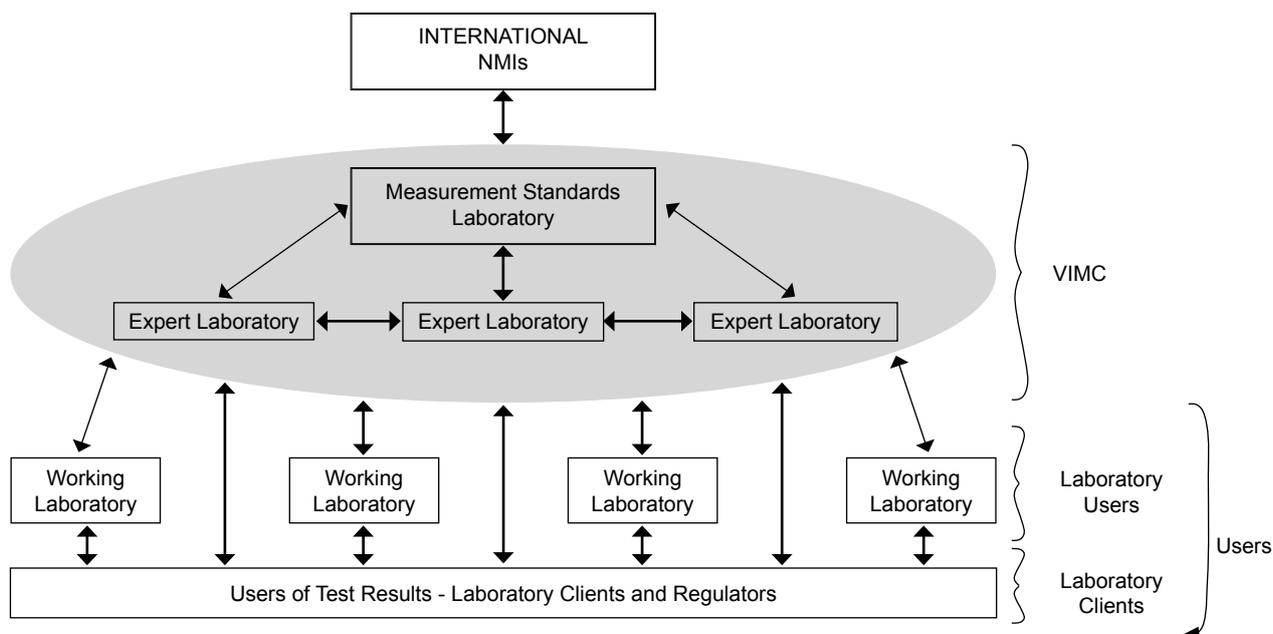


Fig. 1. Relationships of the VIMC to NMIs and NZ user groups

the newer methods of biological measurement, and many of the methods being used in medical testing laboratories, are based on processes that are essentially chemical in nature. These methods require a similar support infrastructure to that needed for chemical measurements; ultimately they will be included within and supported by the VIMC.

The VIMC Web Page

The development of the VIMC in NZ is being led by the Measurement Standards Laboratory with an introductory web page at: <http://www.irl.cri.nz/msl/VIMC/index.html>.

Laboratory, trade, and regulatory users can use this to join the VIMC as members of an awareness group with an interest in the production and appropriate use of high quality and traceable analytical results. The VIMC web page is to be central to the Institute and provide a communication channel for laboratory users of the Institute, NZ experts in chemical and biological measurement, trade and commercial users of laboratory results, and regulators. When fully developed, it will be structured in two levels. Open access will maintain an awareness group of individuals, laboratories, and users of laboratory results interested in chemical and biological measurement, and to whom the VIMC will circulate information on laboratory best practice and use of analytical reports. A secure level will be accessible by VIMC members only.

The MSL has already made contact with staff in a number of laboratories and with a number of users of chemical measurement. From these, it has identified many laboratories and users of chemical measurements who are interested in being involved in the awareness group to assist in the development and application of metrology to chemical and biological measurement. This group comprises contacts from CRIs, industrial research organisations, city and regional councils, manufacturers, testing laboratories, universities, and hospitals.

VIMCs key challenge is to develop this awareness group

and be attractive to industry and trade users from the outset. Ultimately, everyone must recognise that the VIMC offers a unique and high value service that could not otherwise easily or economically be obtained. Those interested are encouraged to join the VIMC as members and to contribute to the national good by supporting better measurement.

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