**Combined Regional Measurement Assurance Program (C-RMAP) Abstract, Instructor(s) and Learning Objectives for Sessions**

**Handbook 105 and Field Standard Updates: Val Miller (held during opening session)**

This session will provide a status report on all current drafts/updates for NIST Handbook 105-series standards and guidance on how to provide input to the documents and their development and acceptance. Updates should include the latest Handbook 105-8 for weight carts, and an updated 105-1 for mass standards, and the status of drafts and field testing on alternative volumetric field standards. Participants will be able to IDENTIFY action items they need to take for implementing new field standards and associated documentary standards, and for or providing comments on draft documentary standards.

**National PT Reports: Val Miller. Isabel Chavez (held during opening session)**

Most Proficiency Tests are coordinating within each of the Regional Measurement Assurance Program groups, but some are coordinated on a national level. National PTs include the 100 gal prover, 500 lb standards, precision mass calibrations (Echelon I).

**RMAP Breakouts: facilitated by RMAP groups (held once)**

Regional Measurement Assurance Program “round table” discussions will be held to capture laboratory updates and changes associated with staffing, facilities, procedures, equipment, standards, and accreditation topics. Laboratory round table sessions help to identify major trends and changes among the laboratory community. Reports focus on changes and challenges related to staff, facilities, equipment, supplier evaluation, standards, operations, economic/workload issues, and regional trends to raise awareness and encourage networking for problem solving. These items are specific to Handbook 143 and the new ISO/IEC 17025, Sections 6.2, 6.3, 6.4, 6.5, and 6.6. Participants will be able to IDENTIFY and DESCRIBE regional trends and issues to their laboratory management and other laboratory staff. Proficiency testing results will be presented by the PT coordinators with analyses and corrective actions discussed among participants. Planning is done to ensure that every laboratory has a PT available to cover every area of their scope at least once every four years. PT Plans must be available for every laboratory and are a Recognition and Accreditation Requirement (every recognized and/or accredited laboratory must have a PT Plan available for their Recognition and/or Accreditation Body). Participants will ensure that the regional plan meets their own laboratory requirements. Potential new software analysis and applications will be presented and reviewed to determine possible application for the OWM program and to provide feedback to potential vendors; alternative approaches are being considered to determine whether program efficiencies can be made and standardized. At the end of this session, participants will be able to LIST all the proficiency tests that are being coordinated nationally and within the region that are applicable for their laboratory, and DESCRIBE at least one new method/approach for PT analysis. Each RMAP will also hold their business and planning meeting.

**Timers. Stopwatches, and Frequency Calibrations: Gary Brown (Alaska), Dan Walker (Ohio) (held once)**

This session will review the new procedures SOP 22 (tuning forks, acoustic emitting devices) and 24 (timers and stopwatches) for calibrations. The traceability hierarchy, NIST services for traceability, and types of equipment and instruments will be presented and discussed. The latest National PTs for tuning forks and stopwatches will also be presented during this session. Hands-on opportunities will be provided to practice performing a calibration of tuning forks or acoustic emitting devices and stopwatches. Uncertainty analyses and evaluation of group repeatability data will be considered. At the end of this session, participants will be able to: IDENTIFY various types of technologies used as reference standards; DESCRIBE the components of the Standard Operating Procedures, including each aspect of traceability, the step-by-step calibration processes, required calculations, measurement assurance methodologies, and uncertainty analysis, and reporting; and PRACTICE performing hands-on calibrations using instruments and standards provided.

**ISO/IEC 17025:2017, Non-conformities… so far! Titi Shodiya (NVLAP), and Team (held twice)**

The transition to ISO/IEC 17025:2017 from the 2005 version has been highlighted for laboratory participants since 2016 – come get the latest information about what gaps and corrective actions have been identified during on-site laboratory assessments. Hear from NVLAP staff and some of their assessors about the top non-conformities that have been observed (unfortunately, some of the top non-conformities may be ongoing issues that have not been resolved since the prior standard was in place!). At the end of this session, participants should be able to IDENTIFY the top non-conformities and be able to DISCUSS ways and procedures to mitigate non-conformities in their own laboratory.

**Load Cells and Force Measurements: Henry Zumbrun (Morehouse Instruments) (held twice)**

This session will take a look at the various types of instruments that are used in force measurements and force instruments used in mass calibrations along with the changes in technology that have occurred in the past few years. At the end of this session, participants will be able to: IDENTIFY various types of technologies used in measuring force; IDENTIFY components of ASTM E74 documentary standard; DESCRIBE the advantages and disadvantages of both proving rings and load cells and changing/new technology; IDENTIFY the major characteristics to consider when purchasing and evaluating a precision load cell; DESCRIBE how to obtain data for load cell repeatability; COMPLETE an uncertainty analysis for using load cells in mass calibrations such as for SOP 4, 8, and/or 33 for weight carts.

**Basic Uncertainties, NISTIR 6969, SOP 29: Jose Torres (NIST) (held twice)**

This session will provide a very basic introduction to uncertainty calculations and reporting using the 8-step process published in NIST SOP 29, beginning with some definitions and concepts from the Guide to the Expression of Uncertainty in Measurement (GUM) and will include simple calculations. NOTE: The content will be is similar to what is covered in the Fundamentals of Metrology seminar, and OWM webinar on this topic, but will include additional hands-on practice calculations. It will provide a useful pre-cursor or review for content covered during the seminar/webinar and will include calculations and a short application quiz. At the end of this session, using SOP 29 and course notes, participants will be able to: DEFINE: standard uncertainty, expanded uncertainty, coverage factor, Type A methods, Type B methods; DESCRIBE the importance of knowing and evaluating measurement uncertainty; Be able to: SPECIFY, IDENTIFY, QUANTIFY, CONVERT, COMBINE, EXPAND, EVALUATE, and REPORT uncertainties for a simple scenario; EXPLAIN the concepts of uncertainty and its relationship to metrological traceability; IDENTIFY documentation requirements for uncertainty calculations within a calibration laboratory; and IMPLEMENT an uncertainty budget based on concepts presented in NISTIR 6969, SOP 29 and the Guide to the Expression of Uncertainty in Measurement.

**Intermediate Excel for the Lab, Level II: Benj FitzPatrick (MN), Jeremy Nading (Oklahoma), Kate Smetana (Colorado) (held twice)**

This session will build on good practices for layout, design, and assessment of spreadsheets used in the metrology laboratories and then use more advanced Excel functions and equations to work with IF statements, nested IF statements, Look-up tables, and equations commonly used in uncertainty calculations which can also be applied to other metrology examples. This session will include introduction to how logical thinking is required for If/Then constructs and how it applies in Excel, how to effectively use look-up tables in a variety of metrology applications, and simplify calculations used in uncertainties, and how some of these functions and equations can be used in metrology situations to improve effectiveness and efficiency in the laboratory. Participants need to be familiar with Excel layouts and structure (cell identifications), know how to enter basic equations in Excel, and be familiar with the equations and content covered in the Basic session. At the end of this session participants will be able to APPLY IF statements, LOOK-UP tables, and more advanced equations (RSS, SUMPRODUCT, SUMSQ, Welch-Satterthwaite, etc.) used in Uncertainty analyses. This session will not cover the use of visual basic or macros. This will be a demonstration and hands-on session - participants will be expected to complete learning objectives and practice activities. (Participants should have covered Software V&V in Fundamentals of Metrology, the OWM Software V&V webinar, or at least read the Software QA procedure that is posted at this link (prior to the session): <https://www.nist.gov/sites/default/files/documents/2018/01/12/procedure-for-software-qa-20180101.pdf>.

**Basic Excel for Metrology, Level I: Isabel Chavez (NIST), Lisa Corn (Texas), Dan Walker (Ohio) (held once)**

Starting with Software Verification and Validation requirements, this session will cover good practices for layout, design, and assessment of spreadsheets used in the metrology laboratories and then use basic Excel functions and equations to perform basic statistical calculations for descriptive and comparative data analysis. Sample learning objectives will include participants being able to do the following in their own laboratory: DESIGN and DEVELOP a spreadsheet using an outcome based intention and ASSESS using software V & V template both during and after development, IMPLEMENT several simple tools, job aids, and references to use and IMPROVE your use of Microsoft Excel within laboratory operations, and the use of statistics such as average, standard deviation, F-test, t-test, En analysis, and Pn analysis. While this is a Basic session, participants need to be familiar with Excel layouts and structure (cell identifications) and know how to enter basic equations in Excel. This will be a demonstration and hands-on session - participants will be expected to complete learning objectives and practice activities.

**Length Calibration and NISTIR 8028, Jose Torres-Ferrer (held once)**

In this session, Standard Operating Procedures (SOPs) from the NISTIR 8028, Selected Laboratory and Measurement Practices and Procedures for Length Calibrations will be reviewed for calibrating rigid rules, measuring tapes (bench method & tape-to-tape), and pi-tapes, including data reduction and uncertainty calculation. Control-charting and report generation will also be discussed. Learning objectives: Participants will be able to follow the procedures to compare an unknown length artifact to a physical standard, calculate the measurement error and uncertainty, and generate a calibration report that complies with ISO/IEC 17025:2017, Section 7.8. This session will include hands-on calibration activities.

**New NISTIR SOPs: Georgia Harris (NIST) (held once)**

OWM has been gathering a collection of standard operating procedures and will be working with laboratories to finalize a new set of SOPs that have not previously been published. These SOPs include: tuning forks/frequency; stopwatches; thermometry; railroad test cars; magnetism in mass; environmental equipment verification; wheel-load weighers; watt hour meters; force measuring devices; water density; mass density; hydrometer calibration; and lottery balls (mass and dimensional). The session will include highlights of several procedures that were not covered during 2018. Participants will be able to HIGHLIGHT the new procedures and DETERMINE which of the procedures are applicable for their laboratories and if their laboratory scope should be modified to include additional measurement capabilities.

**How to Be an Effective Witness in Legal Proceedings, Mark Ruefenacht (NIST) (held twice)**

Weights & Measures enforcement is an oft-overlooked legal activity that takes place across the country on a daily basis. Perhaps not as exciting as the police chases we see on reality television but very important in protecting and preserving consumer rights to fair trade. Whether you are a director, inspector, or Metrologist, the work you do has a “legal” impact on the equipment you inspect and the consumers you protect. This “legal” work occasionally leads to review or litigation. Being prepared to testify in defense of your work, measurements, and skills is essential. At the end of this workshop you will be able to: COMPARE the different roles and responsibilities of a Fact Witness vs. an Expert Witness; LIST five skills of a good witness; DESCRIBE how an expert witness would answer questions related to ISO/IEC 17025, metrology, metrological traceability, calibration, and testing; EXPLAIN metrological traceability to the International System of Units (SI) at a sixth-grade level; PRESERVE evidential chain-of-custody; and PARTICIPATE in a mock trial including questioning and cross-examination.

**New Technology Potpourri: Val Miller (NIST Facilitator) (held once)**

This session will cover standards and instruments associated with electrical vehicle charging stations, compressed natural gas, and density measurements. Participants will be able to identify new technology challenges for weights and measures that will likely impact their laboratory programs or they will have to identify alternative calibration sources for their weights and measures field programs.

**NCSLI Legal Metrology, Committee Meeting, Van Hyder (North Carolina, NCSLI Legal Metrology Chair) (held during closing session)**

This session will include presentation of the 2018 State Laboratory Workload Survey. Learning Objectives: Participants will be able to DESCRIBE the latest workload survey data and provide input into planning the next survey, EXTRACT relevant and critical data for application to their laboratory program for such things as facility evaluations, workload/staffing recommendations, fee structures, succession planning, and inclusion of data in annual Management Reviews.

**OWM Program Directions, OWM Staff (TBD) (held during closing session)**

Come learn about future plans for the OWM Laboratory Metrology program. Participants will be able to IDENTIFY and DESCRIBE coming program and staffing changes.

**The New SI for Mass. Stephan Schlamminger and Patrick Abbott (held at dinner reception)**

Come hear about future of Mass Traceability and the new SI definition for mass. Participants will be able to IDENTIFY and DESCRIBE the changes and impact (if any) of the new SI on their laboratory programs.

**On-site PT for Balances and Scales, Mark Ruefenacht (NIST), Val Miller (NIST) (held multiple times, but requires registration for individual time slots)**

Conducting a PT through circulating a balance or scale is not practical or a good assessment of individual proficiency. During these sessions, participants will have an opportunity to register and complete and on-site demonstration of their knowledge and hands-on proficiency of conducting an evaluation of balances and scales to comply with an optional set of documentary standards. Certificates of successful PT completion will be provided for those participants who successfully demonstrate the required knowledge and proficiency. Balances, scales, and mass standards will be provided for this session. Handbooks, reference materials, forms, data sheets, calculations, or any other tools needed for a successful PT must be provided by participants.